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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DEPOT MAINTENANCE
RADIO SET AN/GRR-7

HEADQUARTERS, DEPARTMENT OF THE ARMY
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11–16 (2)
11–57 (2)
11–500 (AA–AE) (2)
11–557 (2)
11–587 (2)
11–592 (2)
11–597 (2)

NG: State AG (3); units—same as Active Army except allowance is one copy to each unit.
USAR: None.
For explanation of abbreviations used, see AR 320–50.

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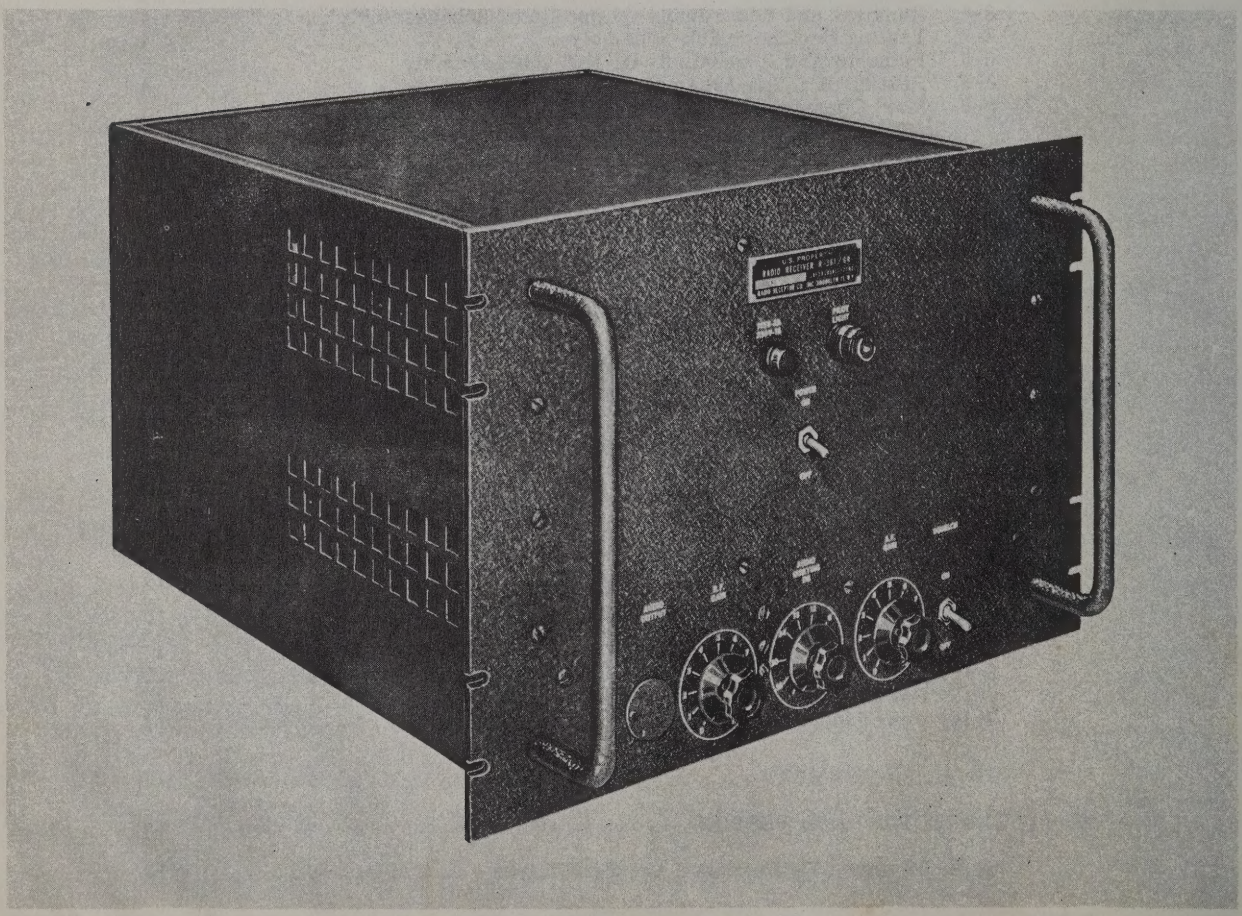

Figure 1-1. Radio Receiver R-361/GR

SECTION I

DESCRIPTION AND LEADING PARTICULARS

1-1. GENERAL.

1-2. This publication comprises overhaul instructions for Radio Receiver R-361/GR, electronic equipment manufactured by Radio Receptor Company, Brooklyn, New York. In addition to the information contained in this handbook, more data is available in the applicable Handbook of Operating Instructions, Service Handbook, and Parts Catalog for this equipment.

1-3. Radio Receiver R-361/GR is a single channel, ground UHF receiver which covers the frequency range from 225 mc to 399.9 mc. It is a double superheterodyne set, utilizing two crystal controlled oscillators. There are two i-f (intermediate frequency) sections, the first of which is 40.4 mc, and the second is 6 mc. In each case, the oscillator frequency is below the desired signal frequency. This receiver is capable of delivering one watt of audio power to a 600 ohm load.

SECTION II

TEST EQUIPMENT AND SPECIAL OVERHAUL TOOLS

2-1. SPECIAL TOOLS.

2-2. No special tools are required for the overhaul of this equipment.

2-3. TEST EQUIPMENT.

2-4. Table 2-1 lists the test equipment required for the overhaul of this equipment.

TABLE 2-1. TEST EQUIPMENT REQUIRED FOR OVERHAUL

Name	Mfr Designation	Alternate	Application
Signal Generator	Measurements Corp. No. 65B	Measurements Corp. No. 80	6 mc tuning on main chassis
Signal Generator	Hewlett-Packard Model 608A	Measurements Corp. No. 80 (do not use for signal to nose ratio measurements; excessive fm)	40.4 mc tuning on main chassis and r-f tuning 225-399.9 mc on r-f sub-assembly
Audio Oscillator	Hewlett-Packard Model 200	Sylvania No. 145	Check audio output on main chassis
A-C Voltmeter	General Electric No. AP-9	Triplett No. 630	Measure line voltage input
Wattmeter	General Electric No. AP-9	Weston No. 432	Measure input wattage
Variac	General Radio No. V-5HMT	Superior Elec. Powerstat Type 216U	Vary input voltage
Cathode Ray Oscilloscope	Dumont No. 304	Dumont No. 208	Check noise limiter on main chassis
Tube Tester	Hickock Model 536	Sylvania Type 220	Check all tubes
Multimeter	Triplett Model 630-A	Simpson Model 360	Output indication, voltage, and resistance measurements
Vacuum Tube Voltmeter	Hewlett-Packard Model 410B	General Radio Type 1800-A	Measure a-c, d-c, and r-f voltages
Distortion Analyzer	Hewlett-Packard Model 330B	General Radio Type 736-A	Measure audio distortion
Frequency Meter	BC 221	None	Calibrate signal generator

SECTION III

SPECIALIZED MAINTENANCE AND REPAIR

3-1. No data, other than that supplied in the applicable Handbook of Service Instructions, is required for specialized maintenance and repair of this equipment.

SECTION IV

DISMANTLING AND DISASSEMBLY

4-1. This equipment does not contain any mechanical components which require disassembly for overhaul purposes.

SECTION V

CLEANING

5-1. CLEANING OF RECEIVER.

5-2. This radio receiver is equipped with a dust cover to minimize the penetration of dust, and does not normally require any special procedure for cleaning beyond that specified in Table 6-5 of the Service Handbook. Clean all tubes, chassis, and mechanical parts with a brush or cloth dipped in carbon tetrachloride. Dust all wiring with a dry brush, taking care not to disturb the position of parts or lead dress. If corroded, clean tube and crystal prongs, as well as fuse ends, with crocus cloth, and wipe with clean cloth.

SECTION VI

INSPECTION

6-1. INSPECTION OF ELECTRICAL COMPONENTS.

6-2. Inspection of electrical portions of the equipment should include the following:

a. Examine the tube and crystal sockets and pins for loose contacts, dirt and corrosion.

b. Inspect capacitor terminals for corrosion.

c. Resistors should be examined for blistering, discoloration and other evidence of overheating.

d. Examine wires, cords and cables for cracked, cut or frayed insulation.

e. Examine sealed components, such as transformers and capacitors, for leakage.

SECTION VII

REPAIR AND REPLACEMENT

7-1. GENERAL.

7-2. With the exception of shorted tuning capacitors C501, C502, C503, C528, and tuning units U401, U402, U403, U404, U501 and U502, there are no parts in this equipment which can be overhauled or repaired economically. When a component part is found to be defective it should be replaced. To insure satisfactory operation of this set, all replacement parts should be mounted in the same position as the original component.

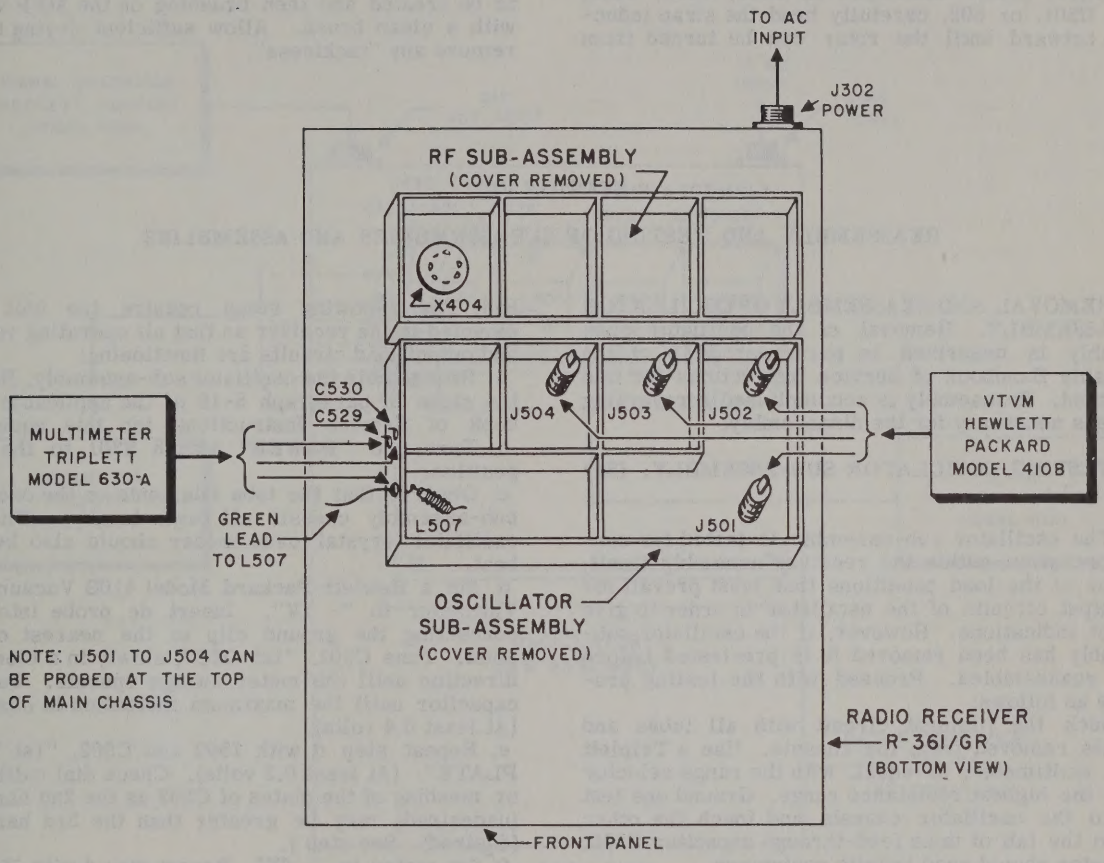

Figure 8-1. Set-up For Oscillator Test

7-3. REPAIR OF TUNING CAPACITORS. Before removing any short-circuit across a tuning capacitor, turn the "POWER" switch S301 to the "OFF" position. Then carefully bend any rotor plates with a sharp instrument such as a knife blade, small screwdriver, or pick, until the rotor plates no longer touch the stator plates as the rotor is turned from maximum to minimum capacitance, i.e. from maximum to minimum meshing of the plates. If a short-circuit occurs between the rotor plates and the one turn silver-plated inductance on U401, U402, U403, U404, U501, or 502, carefully bend the strap inductance outward until the rotor can be turned from maximum to minimum capacitance without touching the inductance.

7-4. RETROPICALIZATION AFTER REPAIRS. All parts appearing under the chassis initially received moisture and fungus proof treatment except tuning capacitors, power resistor R341, variable resistors R327 and R333, switches S302 and S303, and jack J301. Any replaced, resoldered, or rewired component should be treated with TUF-ON-74 MFP Varnish, or equivalent, by cleaning and drying the parts to be treated and then brushing on the MFP varnish with a clean brush. Allow sufficient drying time to remove any "tackiness".

SECTION VIII

REASSEMBLY AND TESTING OF SUBASSEMBLIES AND ASSEMBLIES

8-1. REMOVAL AND REASSEMBLY OF OSCILLATOR SUB-ASSEMBLY. Removal of the oscillator sub-assembly is described in paragraph 5-19 of the applicable Handbook of Service Instructions for this equipment. Reassembly is accomplished by reversing the steps necessary for the disassembly.

8-2. TESTING OSCILLATOR SUB-ASSEMBLY. (See figure 8-1.)

8-3. The oscillator sub-assembly is tested for correct operation within the receiver assembly itself, because of the load conditions that must prevail for the output circuits of the oscillator in order to give correct indications. However, if the oscillator sub-assembly has been removed it is pre-tested before being reassembled. Proceed with the testing procedure as follows:

a. Check the filament circuit with all tubes and crystals removed from the chassis. Use a Triplett 630-A multimeter, or equal, with the range selector set to the highest resistance range. Ground one test lead to the oscillator chassis and touch the other lead to the tab of mica feed-through capacitor C530. The meter should read infinite resistance.

b. Insert five tubes, V501 through V505, into their respective sockets.

c. Set the variable tuning capacitors C501, C502, C503, U501, U502 and C528 to the full mesh position (low frequency position of dial).

d. Insert a crystal type CR-32/U into the crystal socket of oven Y501. This crystal functions as the first oscillator for the receiver. See figure 5-13 of the applicable Handbook of Service Instructions for correct assembly of the crystal into the crystal oven.

e. Insert a type CR-23/U crystal into socket Y502. This crystal has a fixed frequency of 34.4 mc and functions as the second oscillator.

f. Check again for possible short-circuits, using a meter as in step a. Connect one lead to the chassis and the other lead to the green lead originating from the terminal post joining this lead and one end of coil L507. The connection serves as the feed point of the second oscillator for the second mixer. The meter should give an infinite resistance reading.

g. Repeat step f but touch the tab of feed-through capacitor C529. The reading should show infinite resistance. This concludes the preliminary checking of the oscillator sub-assembly.

8-4. The following steps require the unit to be mounted in the receiver so that all operating voltages and output load circuits are functioning:

a. Reassemble the oscillator sub-assembly. Reverse the steps in paragraph 5-19 of the applicable Handbook of Service Instructions for this equipment.

b. Turn the "POWER" switch S301 to the "ON" position.

c. Observe that the tube filaments on the oscillator sub-assembly chassis all begin to glow. The first oscillator crystal oven holder should also begin to heat.

d. Set a Hewlett-Packard Model 410B Vacuum Tube Voltmeter to "- 1V". Insert dc probe into J501, connecting the ground clip to the nearest chassis point. Tune C501, "1st OSC", slowly in a clockwise direction until the meter swings upscale. Tune the capacitor until the maximum indication is observed. (At least 0.4 volts).

e. Repeat step d with J502 and C502, "1st TRIPL PLATE". (At least 0.3 volts). Check dial calibration or meshing of the plates of C502 as the 2nd harmonic (undesired) may be greater than the 3rd harmonic (desired). See step j.

f. Set meter to "- 3V'. Repeat step d with J503 and C503, "1st AMPL PLATE". (At least 1.4 volts).

g. Reset meter to "- 1V" and repeat step d with J504 and U501, "2nd TRIPL PLATE". (At least 0.3 volts).

h. Set the meter to "AC, 3V". Touch the ac probe to pin 7 of X404, the tube socket for V404 in the r-f sub-assembly. Tune U502, "2nd AMPL PLATE", until a maximum reading is observed. (At least 0.5 volts).

Note

When using the ac probe of the vtvm for r-f measurements, clip the short jumper, on the side of the probe, to a place on the chassis near the test point.

i. Set the meter to "AC, 10V" and carefully touch the ac probe to the green wire connected to coil L507. Tune C528, "2nd OSC TUNING", until a maximum reading is obtained. (At least 4 volts).

j. This concludes testing of the oscillator sub-assembly. Before carrying out further tests on the receiver, make certain that the first oscillator tuned

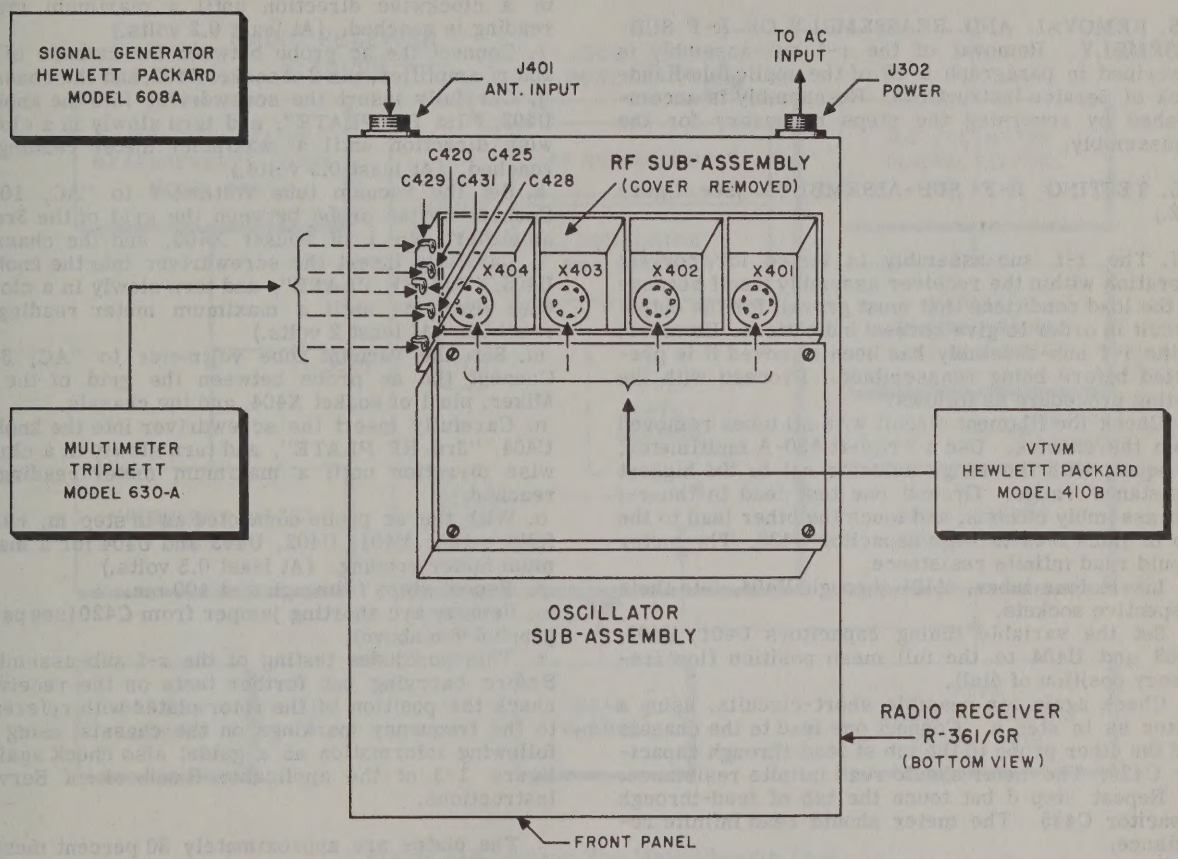

Figure 8-2. Set-up For R-F Test

circuits are tuned to the proper harmonic by comparing the meshing of the capacitor plates with the following guide and reference to figure 1-3, of the applicable Handbook of Service Instructions, for tuning dial settings:

The plates are approximately 80 percent meshed at 225 mc.
The plates are approximately 40 percent meshed at 300 mc.
The plates are approximately 15 percent meshed at 400 mc.

8-5. REMOVAL AND REASSEMBLY OF R-F SUB-ASSEMBLY. Removal of the r-f sub-assembly is described in paragraph 5-18 of the applicable Handbook of Service Instructions. Reassembly is accomplished by reversing the steps necessary for the disassembly.

8-6. TESTING R-F SUB-ASSEMBLY. (See figure 8-2.)

8-7. The r-f sub-assembly is tested for correct operation within the receiver assembly itself because of the load conditions that must prevail for the output circuit in order to give correct indications. However, if the r-f sub-assembly has been removed it is pretested before being reassembled. Proceed with the testing procedure as follows:

a. Check the filament circuit with all tubes removed from the chassis. Use a Triplett 630-A multimeter, or equal, with the range selector set to the highest resistance range. Ground one test lead to the r-f sub-assembly chassis, and touch the other lead to the tab of mica feed-through capacitor C428. The meter should read infinite resistance.

b. Insert four tubes, V401 through V404, into their respective sockets.

c. Set the variable tuning capacitors U401, U402, U403 and U404 to the full mesh position (low frequency position of dial).

d. Check again for possible short-circuits, using a meter as in step a. Connect one lead to the chassis and the other probe to the tab of feed-through capacitor C429. The meter should read infinite resistance.

e. Repeat step d but touch the tab of feed-through capacitor C425. The meter should read infinite resistance.

f. Repeat step d but touch the tab of feed-through capacitor C431. The meter should read infinite resistance.

g. Repeat step d but touch the tab of feed-through capacitor C420. The meter should read approximately 1 megohm (avc bus).

h. Repeat step d but touch the center pin of "ANT. INPUT" connector J401. The meter should read infinite resistance.

i. This concludes the preliminary checking of the r-f sub-assembly.

8-8. The following steps require the unit to be mounted in the receiver so that all operating voltages and the output load circuit are functioning:

a. Reassemble the r-f sub-assembly. Reverse the steps in paragraph 5-18 of the applicable Handbook of Service Instructions for this equipment.

b. Short the avc (automatic volume control) to ground by means of a clip lead from the tab on feed-through capacitor C420 to the chassis.

c. Connect the output of a Hewlett-Packard 608A signal generator to the "ANT. INPUT" jack J401.

d. Turn the "POWER" switch S301 to the "ON" position.

e. Observe that all the tube filaments on the r-f sub-assembly chassis begin to glow.

f. Set the signal generator to 225 mc and adjust for 500 mv output, no modulation.

g. Set a Hewlett-Packard Model 410B Vacuum Tube Voltmeter to "AC, 1V". Connect the ac probe between the cathode of the 1st rf amplifier, pin 2 of socket X401, and the chassis.

h. Carefully insert a screwdriver of the right size into the knob of U401, "ANT.". Turn the knob slowly in a clockwise direction until a maximum meter reading is reached. (At least 0.2 volts.)

i. Connect the ac probe between the cathode of the 2nd rf amplifier, pin 2 of socket X402, and the chassis.

j. Carefully insert the screwdriver into the knob of U402, "1st RF PLATE", and turn slowly in a clockwise direction until a maximum meter reading is reached. (At least 0.5 volts.)

k. Set the vacuum tube voltmeter to "AC, 10V". Connect the ac probe between the grid of the 3rd rf amplifier, pin 1 of socket X403, and the chassis.

l. Carefully insert the screwdriver into the knob of U403, "2nd RF PLATE", and turn slowly in a clockwise direction until a maximum meter reading is reached. (At least 2 volts.)

m. Set the vacuum tube voltmeter to "AC, 3V". Connect the ac probe between the grid of the 1st Mixer, pin 1 of socket X404, and the chassis.

n. Carefully insert the screwdriver into the knob of U404, "3rd RF PLATE", and turn slowly in a clockwise direction until a maximum meter reading is reached.

o. With the ac probe connected as in step m, carefully retune U401, U402, U403 and U404 for a maximum meter reading. (At least 0.5 volts.)

p. Repeat steps f through o at 400 mc.

q. Remove avc shorting jumper from C420 (see paragraph 8-8 b above).

r. This concludes testing of the r-f sub-assembly. Before carrying out further tests on the receiver, check the position of the rotor plates with reference to the frequency markings on the chassis, using the following information as a guide; also check against figure 1-3 of the applicable Handbook of Service Instructions.

The plates are approximately 80 percent meshed at 225 mc.
The plates are approximately 40 percent meshed at 300 mc.
The plates are approximately 15 percent meshed at 400 mc.

8-9. MAIN CHASSIS ALIGNMENT AND TEST FOR RADIO RECEIVER R-361/GR. (See figure 8-3.)

8-10. Each step, in all the following paragraphs, presupposes the satisfactory completion of all preceding steps.

8-11. EQUIPMENT REQUIRED. The test equipment required to align the main chassis and perform the necessary test is listed in Table 2-1.

8-12. ALIGNING AND TEST PROCEDURE. The following steps indicate the method of aligning the main chassis and performing the required tests:

a. Make certain that the following tubes are mounted in their correct sockets: V301, V302, V303, V304, V305, V306, V307, V308, V309, V310, V311 and V312.

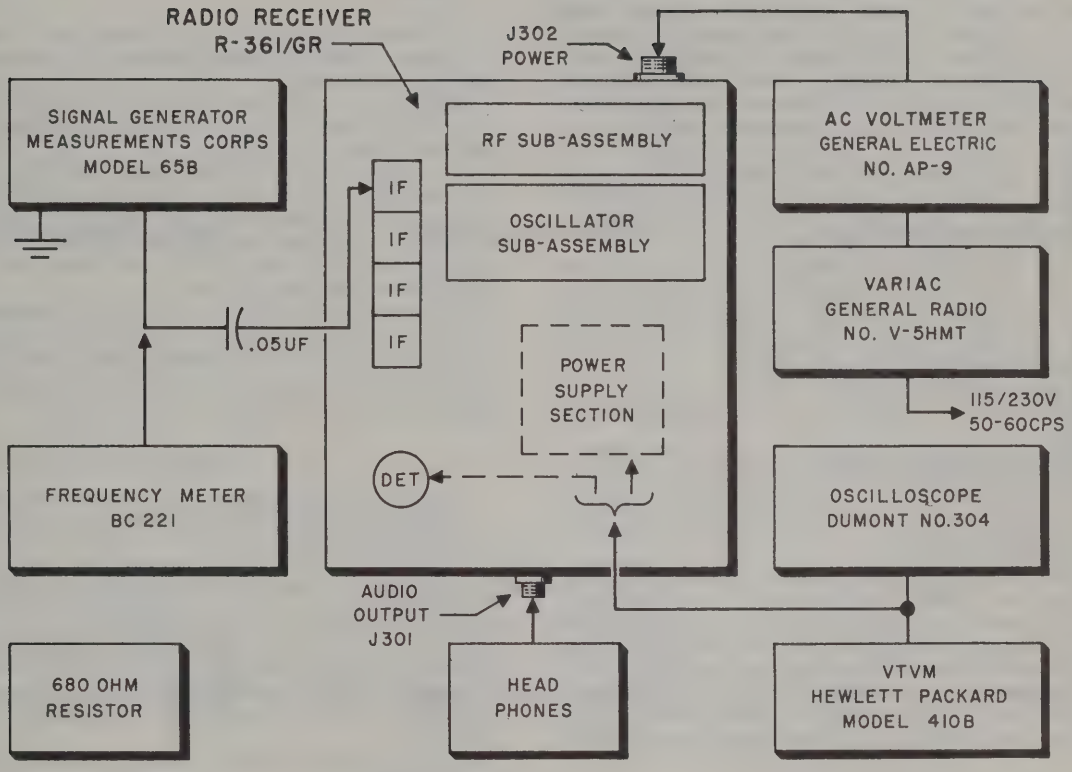

Figure 8-3. Set-up For Main Chassis Test

b. Turn the "POWER ON-OFF" switch to "OFF".
c. Turn the "R.F. GAIN" control to extreme clockwise position. (Pointer should indicate "10".)
d. Turn the "AUDIO QUIETING DB" control to extreme counterclockwise position.
e. Turn the "A.F. GAIN" control to extreme counterclockwise position.
f. Turn the "SQUELCH" switch to "OFF" position.
g. Turn the "NOISE LIMITER SWITCH", located on the main chassis, to the "OFF" position.
h. Short the avc bus to ground, by means of a jumper from the junction of R342 and R343 to the chassis.
i. If r-f and oscillator sub-assemblies are out of receiver assembly, dress their three power leads (red, blue, brown) so as not to short against chassis.
j. Set the vacuum tube voltmeter to the RX1K ohms scale. Ground the "COMMON" lead, and touch the "OHMS" lead to pin No. 2 of V312 (rectifier filament). The meter should read approximately 20,000 ohms to ground.
k. Connect the variac and line voltmeter as shown in figure 8-3. With the variac switch in the "OFF" position, insert the power plug into the "POWER" receptacle, at the rear of the chassis.
l. Set the vacuum tube voltmeter on the 30 volt ac range. Connect the "COMMON" lead to the chassis, and the ac probe to the high potential terminal of C348. (The high potential terminal is the one that terminates a red wire from the cable.)
m. Turn the variac switch to "ON", and adjust the variac until the line voltmeter reads approximately 115 volts.
n. Set the "POWER" switch on the receiver to "ON". All 12 tubes on the main chassis should light. The "PILOT LIGHT" on the front panel should light. If the pilot light does not go on, rotate the rim of the light counterclockwise.
o. Set the variac so the line voltmeter reads 115 volts.
p. Turn the "RANGE" switch on the vacuum tube voltmeter to a lower setting, until a reading is obtained. This reading should be less than 0.78 volts.
q. Set the vacuum tube voltmeter to the "+300V DC" range. Connect the "COMMON" lead to the chassis, and touch the "DC" lead to the high potential side of C348. The meter should read approximately 215 volts.

8-13. I-F ALIGNMENT. After all the steps in paragraph 8-12 have been completed, proceed as follows:
a. Turn the "POWER" switch of the receiver to "OFF".
b. Set the vacuum tube voltmeter to "- 3V DC" scale, and connect "DC" lead to the junction of R325 and S303.
c. Connect one side of a 0.05 uf paper or mica capacitor in series with the center conductor lead from the signal generator. Connect the other side of the capacitor to the center tab of C351, by means of a clip lead.
d. Connect the ground lead from the signal generator to the receiver chassis, by means of a short length of bus wire (three inches or less).

Note

When connecting the signal generator to the receiver, the length of the connecting leads must be kept to a minimum.

e. Make certain the "MODULATION" control on the signal generator is set to "OFF".
f. Set the frequency meter to 6 mc, and connect it to the center conductor of the signal generator.
g. Set the output of the signal generator to 500,000 uv, and carefully turn the frequency dial until zero beat is heard in the earphones, plugged into the frequency meter.
h. Disconnect the frequency meter from the circuit. The signal generator is now set to 6 mc.

Note

Do not turn the frequency control knob on the signal generator once the alignment has been started.

i. Increase the output of the signal generator until the vacuum tube voltmeter swings to approximately one third full scale.
j. Using a 1/4 in. socket wrench, tune the bottom slug of L307, until a maximum reading on the vacuum tube voltmeter is obtained.
k. Carefully place a 680 ohm aligning resistor across the primary of i-f transformer T303. This resistor is supplied with the equipment, and is attached to the clips holding the socket screw keys. For location, see figure 6-1 of the applicable Handbook of Service Instructions.
l. Increase the output of the signal generator until the vacuum tube voltmeter begins to move upscale.
m. Using a 1/4 in. socket wrench, slowly tune the secondary (top slug) of T303, until a maximum reading is obtained on the vacuum tube voltmeter.

Note

Prevent the vacuum tube voltmeter from slamming upscale, by reducing the output of the signal generator.

n. Remove the 680 ohm resistor from the primary of T303, and apply it to the secondary.
o. Using a 1/4 in. socket wrench, slowly tune the primary (bottom slug) of T303, until the vacuum tube voltmeter indicates maximum.
p. Repeat steps k through o on i-f transformers T305 and T306.
q. As a double check, perform steps k through p once again.
r. Remove the 680 ohm aligning resistor.

8-14. Determine the center frequency of the i-f strips as follows:
a. Using the signal generator, vary the frequency above and below 6 mc and notice that a peak is obtained in both instances. Now vary the frequency meter from one peak to the other, and note the frequency between the two peaks, at which minimum output from the i-f strip is obtained.
b. Connect the frequency meter to the output of the signal generator. Increase the output of the signal generator until sufficient signal is available, at the frequency meter, to detect a beat-note. The frequency meter dial setting corresponds to the center frequency of the i-f strip, and should be 6 mc ±1 kc.

8-15. BANDWIDTH MEASUREMENTS. Upon completion of all steps in paragraphs 8-13 and 8-14, proceed to obtain the bandwidth measurements as follows:
a. Set the signal generator to the same frequency as determined in paragraph 8-14.
b. Set the output of the signal generator to 500 uv. Read and record the reading on the vacuum tube voltmeter.

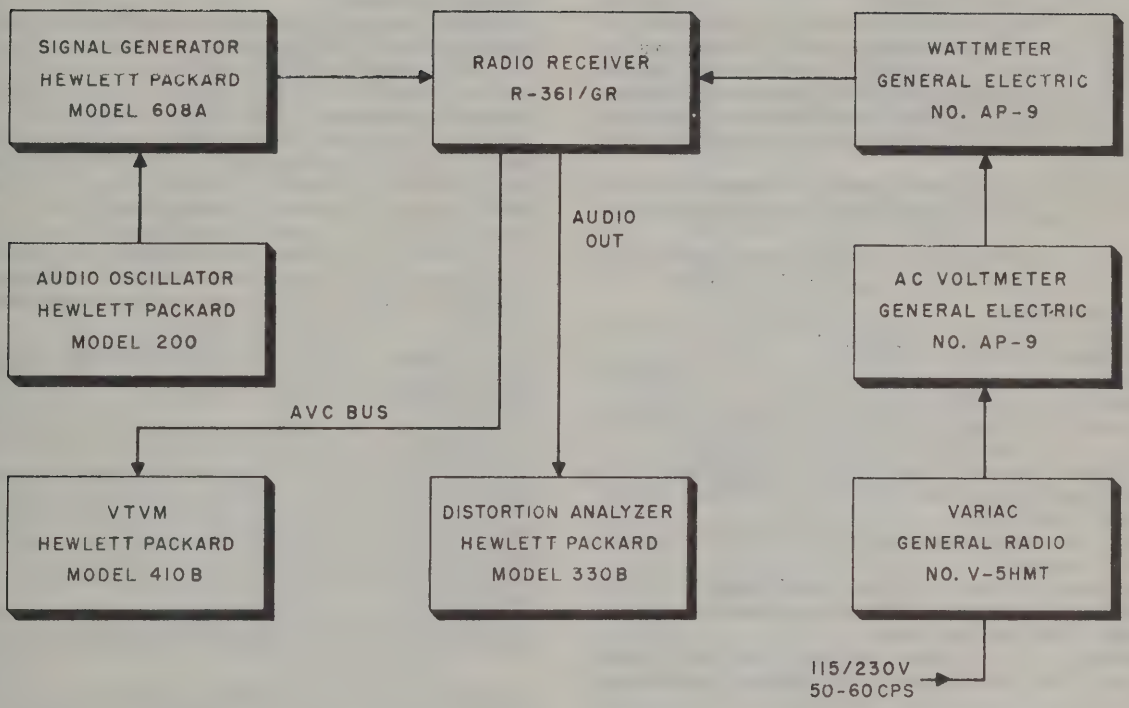

Figure 9-1. Set-up For Final Electrical Test

c. Increase the output of the signal generator to 1,000 uv. Detune the signal generator below the i-f center frequency, until the vacuum tube voltmeter shows the same reading as obtained in step b of this paragraph. Determine and record the frequency of the signal generator at this setting. Use the frequency meter, as outlined previously, to determine the frequency.

d. Repeat step c, but at this time detune the signal generator for the frequency above the i-f frequency, which gives the same scale reading on the vacuum tube voltmeter, as was obtained in step b.

e. The frequency difference between steps c and d above, is the 6 db bandwidth. The average 6 db bandwidth should be more than 85 kc for receivers with serial numbers below 800, 60 kc for receivers with serial numbers 800 or above.

f. Increase the output of the signal generator to 500,000 uv and repeat steps c and d. The difference between these two frequency measurements is the 60 db bandwidth. The average 60 db bandwidth should be less than 225 kc for receivers with serial numbers below 800, 175 kc for receivers with serial numbers 800 or above.

g. Typical i-f response curves are shown on figure 7-5 of the applicable Handbook of Service Instructions.

8-16. AVC ALIGNMENT. After all steps in paragraph 8-15 have been completed, proceed as follows, for the avc alignment:

a. Make certain the "MODULATION" control on the signal generator is set to "OFF".

b. Reset the signal generator to 6 mc, using the frequency meter for the exact setting.

c. Remove the avc grounding connection from the junction of resistors R342 and R343 to ground.

d. Transfer the d-c lead of the vacuum tube voltmeter from the junction of R325 and S303, to "AVC METER" jack J303.

e. Set the vacuum tube voltmeter "RANGE" switch to "- 3V" range.

f. Increase the output of the signal generator until the vacuum tube voltmeter moves upscale for approximately 1/3 of the full scale.

g. Using a 1/4 in. socket wrench, tune the bottom slug of T302, until a maximum output is obtained.

8-17. NOISE LIMITER CHECK. Upon completion of the steps outlined in paragraph 8-16, proceed with a noise limiter check, as follows:

a. Connect a probe from the oscilloscope to the junction of R325 and S303.

b. Set the "NOISE LIMITER SWITCH" S303 to the "ON" position.

c. Plug the headphones into the receiver "AUDIO OUTPUT" jack J301.

d. Set the modulation switch on the signal generator to 1,000 cycles.

e. Set the output of the signal generator to 50,000 uv. Gradually increase the "PERCENT MODULATION" control of the signal generator, and observe the oscilloscope pattern.

f. Carefully synchronize the oscilloscope to observe the waveshape. On low percentages of modulation, the waveshape is sinusoidal. Beyond 70 percent modulation, clipping of the sine wave should result, and simultaneously a loud 1,000 cycle note should be audible in the headphones. The clipping of the sine wave is an indication that the noise limiter circuit is functioning properly.

8-18. SQUELCH CHECK. The squelch action may be checked as follows:

a. Set the signal generator to 50,000 uv, 50 percent modulation at 1,000 cycles.

b. Set the "SQUELCH" to "ON".

c. Turn the "R.F. GAIN" control R309 to extreme counterclockwise position.

d. Slowly turn the "R.F. GAIN" control clockwise. The output of the receiver, heard in the headphones, should suddenly appear at audible level. Similarly, when turning counterclockwise, the signal should suddenly drop to a practically inaudible level. This is an indication that the squelch circuit is operating.

e. Observe the dial setting of the "R.F. GAIN" control at the point where the audio suddenly drops.

8-19. "AUDIO QUIETING DB" CONTROL CHECK Upon completion of the squelch circuit check, proceed as follows:

a. Set the "R.F. GAIN" control at the point obtained in paragraph 8-18 step e.

b. Gradually turn the "AUDIO QUIETING DB" control R333 to the extreme clockwise position. The output of the receiver, as heard in the headphones, should be restored to the approximate level that was heard before the "R.F. GAIN" control was turned counterclockwise.

c. The restoration of the audio level is an indication that the "AUDIO QUIETING DB" control is functioning.

8-20. "A.F. GAIN" CONTROL CHECK. A check of the "A.F. GAIN" control R327 may be made as follows:

a. Reset the "R.F. GAIN" control to the extreme clockwise position.

b. Slowly turn the "A.F. GAIN" control to the extreme counterclockwise position. The audio level, heard in the headphones, should gradually drop off, to a much lower level. This is an indication that the "A.F. GAIN" control is functioning.

SECTION IX

REASSEMBLY AND TESTING OF COMPONENTS

9-1. FINAL ELECTRICAL TEST FOR RADIO RECEIVER R-361/GR. (See figure 9-1.)

9-2. Before this receiver can be given a final electrical test, check to see that the following conditions have been fulfilled:

a. All tests described in paragraphs 8-12 through 8-20 have been performed, and the main chassis is known to operate satisfactorily.

b. The receiver is completely assembled, with oscillator and r-f sub-assemblies in place and connected to the main chassis by reversing the steps for removal

of the sub-assemblies, paragraphs 5-16 through 5-19 of the applicable Handbook of Service Instructions.
c. Crystal Y502 is plugged into the oscillator sub-assembly. (This crystal operates at a fixed frequency of 34.4 mc).
d. Crystal Y501 has been placed in oven A501, and is the correct value for the desired r-f frequency. In the following test procedure, the r-f signal has arbitrarily been selected at 399.9 mc. Therefore, by the equation given in paragraph 1-8 of the applicable Handbook of Service Instructions the correct first oscillator crystal frequency is 39.944444 mc. It should be noted, that this test procedure is also valid for any other r-f frequency between 225 and 400 mc. The only qualifying condition is that the first oscillator crystal has the correct frequency for the selected r-f signal.
e. The unit has been tuned for the crystal frequency, selected as outlined in paragraph 6-19 of the applicable Handbook of Service Instructions.

9-3. EQUIPMENT REQUIRED. The test equipment required to perform the final electrical tests for Receiver R-361/GR is listed in Table 2-1.

9-4. CONTROL SETTINGS. Set the following controls as indicated below:
a. Turn the "POWER" switch S301 to "OFF".
b. Turn the "R.F. GAIN" control R309 to extreme clockwise position.
c. Turn the "SQUELCH" switch S302 to "OFF".
d. Turn the "AUDIO QUIETING DB" control R333 to extreme counterclockwise position.
e. Turn the "A.F. GAIN" control R327 to extreme clockwise position.
f. Turn the "NOISE LIMITER SWITCH" S303, located on the main chassis, to "ON".

9-5. TEST SET-UP. Connect the receiver in the following manner:
a. Connect a power line to the "POWER" socket J302, located on the rear panel. This power line should be provided with a variac and meters to permit adjustments of the proper line voltage. See figure 6-3 of the applicable Handbook of Service Instructions.
b. Place a 600 ohm 2 watt resistor across the "METER" terminals of the distortion analyzer.
c. Terminate the "MUTING" terminals on E303, or the "AUDIO OUTPUT" jack J301, in the "METER" terminals of the distortion analyzer.
d. Place a jumper between the "AF INPUT" and "METER" terminals of the distortion analyzer. This will permit the use of this instrument as an output meter as well as a distortion analyzer, without necessitating reconnection during the subsequent tests.
e. Connect the output of the signal generator to the "ANT. INPUT" socket J401, located on the rear of the receiver.
f. Set the vacuum tube voltmeter to read negative d-c volts by placing the "SELECTOR" switch to "- VOLTS". Set the "RANGE" switch to "10 V".
g. Connect the d-c probe of the vacuum tube voltmeter in series with a 1 megohm 1/2 watt resistor to pin 1 of V301.

9-6. TUNING PROCEDURE. The following procedure indicates the tuning process for the receiver:
a. Throw the "POWER" switch to "ON".
b. Check that all 21 tubes glow, and the pilot light on the front panel is lit.
c. Using an insulated screwdriver, slowly turn the "2ND OSC TUNING" trimmer C528, until the vacuum tube voltmeter indicates a maximum deflection.
d. Remove the d-c probe and resistor from pin 1 of V301.
e. Set the vacuum tube voltmeter to read negative volts on the "3 V" scale.
f. Connect the d-c probe of the vacuum tube voltmeter to the junction of R325 and S303.
g. Set the signal generator to approximately 400 mc.
h. Set the output of the signal generator to maximum. Slowly rotate the frequency dial of the signal generator, until the maximum output is obtained (as indicated on the vacuum tube voltmeter).
i. Rotate the attenuator on the signal generator, until a half scale reading is observed on the vacuum tube voltmeter.
j. Carefully adjust the signal generator frequency, until the vacuum tube voltmeter indicates a maximum deflection.
k. Tune the following adjustments for a maximum output, in the order given below. For location of these controls, see figure 1-3 in the Handbook of Service Instructions for this equipment.

"2ND AMPL PLATE", (U502)
"ANT", (U401)
"1ST RF PLATE", (U402)
"2ND RF PLATE", (U403)
"3RD RF PLATE", (U404)
T301 (top slug)
T301 (bottom slug)
L307 (bottom slug)

l. As a double check, repeat the tuning adjustments of step k above.
m. Remove the d-c probe from the junction of R325 and S303.

9-7. SENSITIVITY CHECK. The receiver is designed to provide 10 mw of audio power across a 600 ohm balanced load, with an input signal not greater than 3 uv, modulated at 30 percent at a frequency of 1,000 cps. These conditions must be met when maintaining a minimum signal plus noise-to noise ratio of ten to one. After completing the steps in paragraph 9-6, set up the receiver in the following manner:
a. Set the "R.F. GAIN" control so that a 5 uv signal, 30 percent modulated at 1,000 cycles, operates the squelch, and supplies an audio signal when "SQUELCH" switch S302 is "ON".
b. Turn the "SQUELCH" switch to "OFF".
c. Set the "NOISE LIMITER SWITCH" S30 to "ON".
d. Check the power supply. It should be either 115 or 230 volts at 50/60 cycles. Use the variac to obtain this reading, if necessary.
e. Set the "AUDIO QUIETING DB" control R333 at the extreme counterclockwise position.
f. Set the distortion analyzer to the "3 VOLT" scale, by means of the "R.M.S. VOLTS" switch.
g. Set the "ATTENUATOR" dial of the signal generator to 2.0 uv, modulated with 1,000 cycles at 30 percent.
h. Set the "A.F. GAIN" control on the receiver, to give a reading of 0 db on the distortion analyzer. This reading corresponds to 10 mw of receiver output across 600 ohms.
i. Turn the modulation control knob on the signal generator to "EXT. MOD.".
j. If the distortion analyzer meter does not read -10 db, at this point, repeat steps f through i, with other "ATTENUATOR" settings. Set the "ATTENUATOR" above or below 2.0 uv, as required, until the 10 db drop in level is obtained. When the 10 db drop is

obtained, the reading of the "ATTENUATOR" dial is the sensitivity of the receiver in uv.

9-8. IMAGE REJECTION. In order to determine the image rejection, proceed as follows:
a. Set the receiver to the normal 5 uv squelch sensitivity (see paragraph 9-7 a).
b. Turn the "SQUELCH" switch to "OFF".
c. Adjust the signal generator to 30,000 uv of output.
d. Tune to the image frequency. The image frequency for 400 mc = 400 -2(40.4) = 319.2 mc where 40.4 is the i-f frequency.
e. When the response is encountered, readjust the signal generator level to develop the same output (10 mw). Image rejection should be 80 plus or minus 10 db.

9-9. AVC CHARACTERISTICS. The design specification for this equipment limits the maximum total change of output to 4 db for an input range of 10 to 100,000 uv. With an input of one volt, the audio output level is not to vary more than 6 db above one watt. To check the avc characteristics, proceed as follows:
a. Adjust the "R.F. GAIN" control as explained in paragraph 9-7 a.
b. Set the "A.F. GAIN" control to produce one watt output with 50 uv input, which is the 0 db reference level in this case. Note again that one watt equals 24.5 volts across 600 ohms.
c. Vary the output of the signal generator to 10, 1,000, 10,000 and 100,000 uv, as well as 1 volt, while maintaining 30 percent modulation at 1,000 cycles. The output variation should be less than 4 db for signals up to 100,000 uv and less than 6 db for a one volt input. If a greater deviation is recorded, see applicable Handbook of Service Instructions paragraph 6-12 for repair of the avc circuit.

9-10. AUDIO POWER OUTPUT. The audio power output for this receiver, should be at least one watt across 600 ohms with an r-f input signal of 50 uv modulated 30 percent, at an audio rate of 400 to 3,000 cps. In order to check this, proceed as follows:
a. Set the "A.F. GAIN" control to the extreme clockwise position.
b. Set the output of the signal generator to 50 uv, 30 percent modulated with 400 cps and then 1,000 cps (both internal).
c. Modulate the signal generator externally with 3,000 cps from the audio oscillator.
d. The power output should indicate at least one watt for any of the modulations used.

9-11. AUDIO FREQUENCY RESPONSE. The frequency response for this receiver should be flat within 5 db for the range of 400 to 3,000 cps. It is not to exceed -10 db below 200 cps, or above 5,000 cps. Reference level is established at 1,000 cps with a rated output of one watt across 600 ohms. To check the audio frequency response, proceed as follows:
a. Turn the "SQUELCH" switch to "OFF".
b. Connect the signal generator for external modulation by the audio oscillator, and feed a 100 uv signal modulated at 30 percent at 1,000 cps into the receiver at 400 mc.
c. Adjust the "A.F. GAIN" control, on the receiver, for an output of one watt (24.5V on the 30 volt scale of the distortion analyzer) across 600 ohms.
d. Record the difference, in db, from one watt at 200, 400, 1,000, 3,000 and 5,000 cps.

9-12. DISTORTION. The requirements for this equipment are that a 100 uv input signal, modulated 30 percent at 1,000 cps shall not produce an output signal with a total harmonic distortion exceeding 5 percent. At 70 percent modulation and 100,000 uv signal, total harmonic distortion shall not exceed 15 percent. All distortion measurements are to be made at rated one watt of output. Proceed as follows to check for distortion.
a. Adjust the signal input to 100 uv, 30 percent modulated at 1,000 cps.
b. Adjust the "A.F. GAIN" control for one watt of output across 600 ohms.
c. Measure the distortion using the distortion analyzer.
d. Adjust the signal generator to 100,000 uv, 70 percent modulated at 1,000 cps.
e. Adjust the "A.F. GAIN" control for one watt of audio power.
f. Measure the distortion using the distortion analyzer.

9-13. POWER SUPPLY SIGNALS. The requirement for this equipment is less than one mw of power across 600 ohms (less than 0.78 volts). Check the power supply signals as follows:
a. Feed a 1,000 uv unmodulated signal into the receiver.
b. Using the distortion analyzer, set the function switch to "METER" on the 1.0 scale.
c. Read the output in volts, as specified above. The meter should read less than 0.78 volts.

9-14. POWER INPUT. The average power input shall be less than 150 watts. Check the power input as follows:
a. Adjust the variac for 115 or 230 volts on the line voltmeter. Refer to the voltage nameplate on the rear of the dust cover.
b. Note the reading on the wattmeter. 125 watts is a typical value.

SECTION X

FINAL REASSEMBLY

10-1. No instructions, other than those given in Sections VIII or IX are required for final reassembly of this equipment.

SECTION XI

INSPECTION AND TESTING

11-1. GENERAL.

11-2. For test and alignment procedures, see paragraphs 6-4 and 6-19 of the applicable Handbook of Service Instructions.

11-3. MINIMUM PERFORMANCE AND TEST VALUES. Minimum performance and test values have been included in Sections VIII and IX, for each test performed.

11-4. Marking of equipments required by Government T.O.'s or other instructions, to indicate overhaul or the incorporation of changes, shall be applied during inspection and test (if not previously applied to subassemblies, assemblies, or components during overhaul and assembly).

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